

# Nervous system

## Peripheral Nervous System

It consists of **Peripheral Nerves** and **Ganglia**.

**1-Peripheral Nerves:** - are composed of bundles of nerve fibers (mostly the axons) held together by C.T and include spinal nerves connected to the spinal cord and cranial nerves connected with the brain. Surrounding the entire nerve is a sheath of relatively strong C.T termed the **epineurium** it is composed of fibroblast and collagenous fibers and few elastic fiber, the epineurium contains the major blood vessels to the nerve. Within the epineurium, nerve fibers are grouped into bundles or **fascicles**, each fascicle is surrounded by a C.T perineurium which has the important function of protecting the nerve fibers and helping maintain the internal microenvironment.

**2-Ganglia:-** are typically ovoid structures containing nerve cell bodies and glial cells supported by C.T, They serve as stations to transmit nerve impulses, one nerve enters and another exists from each ganglion.

**There are 2 types of ganglia:**

**A- Sensory Ganglia:** are associated with cranial and spinal nerves and composed of nerve cells' bodies which are enveloped by thin sheet of **satellite cells** which nourish and regulate the microenvironment of the nerve cells bodies. Those ganglia are supported by CT capsule which is continuous with the CT layers of nerves. The capsule sends trabeculae into the ganglion. Sensory ganglia **receive** afferent impulses that go to the CNS.

**B- Autonomic Ganglia:** are small bulbous dilatations in autonomic nerves. Autonomic nerves affect the activity of smooth muscle, the secretion of some glands, modulate cardiac rhythm and other involuntary activities. These ganglia usually have multipolar neurons, unlike sensory ganglia.

## Central Nervous System (Brain and Spinal Cord).

The brain lies within the cranial cavity of the skull and the spinal cord occupies the vertebral canal within the vertebral column. Beneath the bony coverings the brain and spinal cord are protected and nourished by 3 membranes called meninges that are located between the bone and soft tissue of the nervous system. The only C.T within CNS is very small amount of delicate areolar tissue associated with numerous capillaries and hence the substance of CNS is soft.

The CNS has a characteristic tissue arrangement called **grey matter** and **white matter**. **Grey matter** contains the cell bodies (perikarya) of neurons and the supporting cells (neuroglia) as well as unmyelinated dendrites.

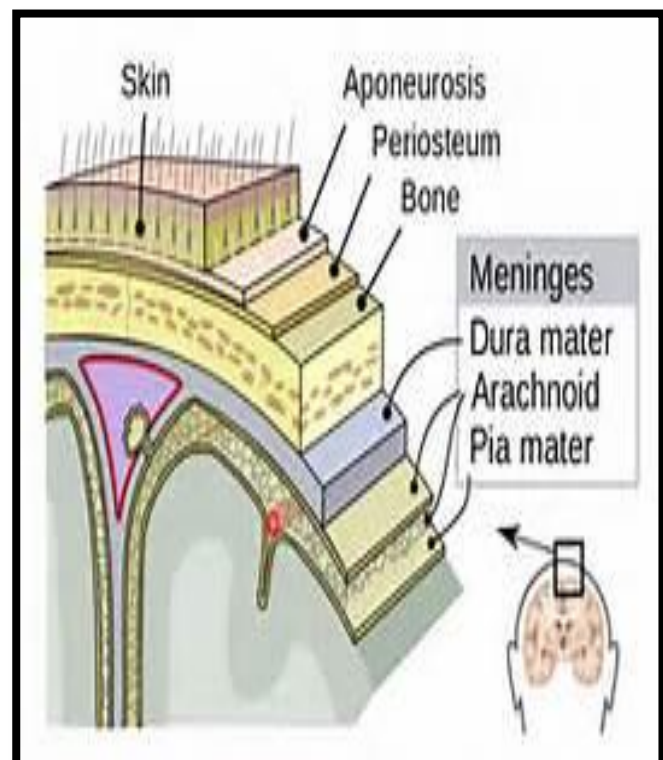
**White matter** does **not** contain any cell bodies, but mostly contains myelinated nerve fibres. **The central region** of the spinal cord is **grey matter**, and the surrounding region is **white matter**.

**A-The Meninges:** protective connective tissue sheaths surrounding the brain and spinal cord. Contain 3 layers, dura mater, arachnoid and pia mater.

**1-Dura mater:** - is the thick external layer consisting of **dense fibro-elastic C.T** continuous with the periosteum of the skull around spinal cord the dura mater is separated from periosteum of the vertebra by the epidural space.

**2-Arachnoid:-** has 2 components : a sheet of C. T in contact with dura mater. And a system of Loosely arranged trabeculae containing fibroblasts and collagen fibers.

**3-Pia mater:-** is the inner most layer, it is lined by **flattened mesenchymal** derived cells.



## B-Cerebrum

Consist of 2 large masses called **cerebral hemispheres** connected by a deep bridge of nerve fibers; covered by thin layer of gray matter called the **cerebral cortex** form. The outermost portion of the cerebrum containing nerve cell bodies, fibers, neuroglia and blood vessels. Just beneath the cortex, masses of white matter are present making up the thick bulk of cerebrum.

## C-Cerebellum

The cerebellar cortex which coordinates muscular activity throughout the body has 3 layers:

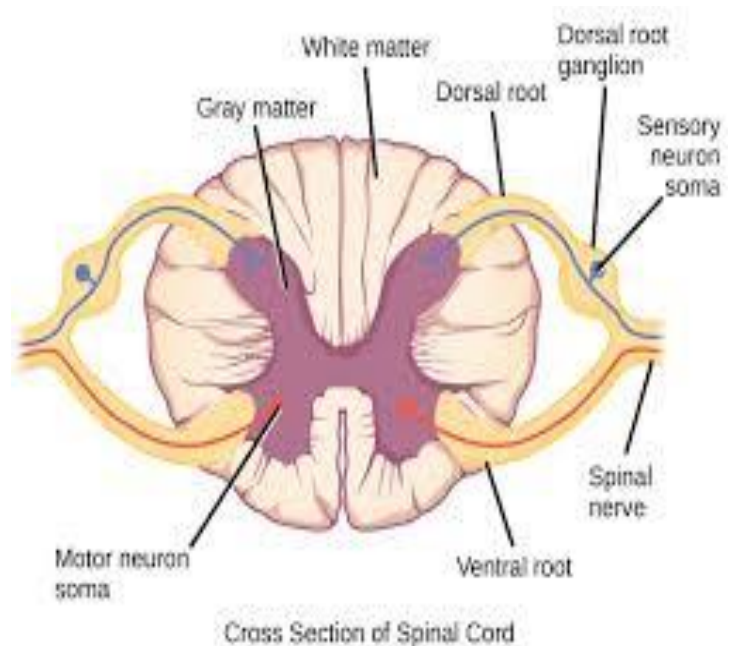
a- **Outer layer** : composed of small nerve cells bodies and many unmyelinated nerve fibers

b- **The central layer**: composed of **Purkinji cells** which are large flask-shaped neurons with extensively branched dendrites

c- **Inner** most layer composed of very small neurons packed together densely.

## D-The spinal cord

In cross sections of the spinal cord, white matter is peripheral and gray matter is Internal and has the general shape (**H**). The arms of the **H** are made up of the bilateral anterior and posterior **horns** of the cord. A horizontal bar of gray matter in the middle of spinal cord, this bar surrounds the **central canal** which contains **C S F** and lined by **ependymal cells**.



***Reference:***

***1- diFIORE'S Atlas of histology with Functional Correlations, eleventh edition,2008.***

***2- diFIORE'S Atlas of histology with Functional Correlations, twelfth edition,2013.***

***3- Jonquiere's basic histology text and atlas 13<sup>th</sup> edition (2013) by Anthony L. Mescher ; Di Fiore's Atlas of Histology 12<sup>th</sup> ed. (2013) Victor P. Eroschenko***